REMARKS/ARGUMENTS

Reconsideration of the application is requested.

Claims 1-14 are now in the application. Claims 1 and 12 have been amended. Claims 13-14 have been added.

In item 2 on page 2 of the above-mentioned Office action, claims 1 and 9 have been rejected as being anticipated by Yoshino (US Pat. No. 6,063,649) under 35 U.S.C. § 102(b).

In item 3 on pages 2-3 of the above-mentioned Office action, claims 1-5, 9, and 11-12 have been rejected as being anticipated by Hogerton et al. (US Pat. No. 5,714,252) under 35 U.S.C. § 102(b).

The rejections have been noted and claims 1 and 12 have been amended in an effort to even more clearly define the invention of the instant application. More specifically, the language of claims 1 and 12 has been modified to even more clearly recite that the bonding agent is brought to solidification to form a rigid electric contact before the plastic deformation of the substrate takes place.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claim 1 calls for, inter alia:

producing a permanent electrically conductive connection by the steps of:

melting the bonding agent by heating the bonding agent to the melting point;

bringing the bonding agent to solidification;

increasing a joining temperature above a glass transition temperature of the substrate without causing the bonding agent to remelt; and

exerting a pressure on the electrical component resulting in the substrate experiencing a plastic deformation and the electrical component being pressed together with the conductor structure into the substrate in a positively locking manner, and the bonding agent being brought to solidification to form a rigid electric contact before the plastic deformation of the substrate takes place.

Claim 12 calls for, inter alia:

bringing the bonding agent to solidification; and

exerting a pressure on the electrical component, diffusing heat to the substrate from at least the bonding agent resulting in the substrate experiencing a plastic deformation and the electrical component being pressed together with the conductor structure into the substrate in a positively locking manner for forming a permanent electrical conductive connection, the bonding agent remaining in a solid state during the diffusion of the heat.

The method of the invention of the instant application includes the method step, by which the bonding agent is

brought to solidification before the plastic deformation of the substrate takes place. The specification discloses how this feature is achieved. If the bonding is realized by a solder material, this material is chosen to have a low melting point, which increases during the soldering process. A eutectic or an intermetallic phase is suitable, because the solidification takes place before the substrate has been heated to its melting point, and the melting point of the formed alloy is sufficiently increased to avoid re-melting of the soldering material. Another possibility is the application of a bonding adhesive, which is locally heated and remains in its solid state afterwards during the diffusion of heat, which causes the deformation of the substrate. This method is advantageous because the electric connections are formed first and the deformation of the substrate takes place only after rigid bonds have been produced between the electric contacts. This is contrary to the methods of the two cited references.

Yoshino discloses a method by which a semiconductor chip is mounted on a wiring substrate. According to the paragraph in column 2, lines 34 to 40, this method is intended to solve a problem known from prior art, which arises when the chip and the substrate are mounted by exerting pressure and heating to cure an adhesive insulative resin between the components. The

pressure and heating result in a slight deformation of the substrate, which is not desired. This is contrary to the object of the invention of the instant application, which is to secure all the electric connections, even if the surface structure of the components is not planar. To this end, the foil forming the substrate is slightly deformed in order to compensate for differences in the surface levels. Yoshino is only concerned with the problem of how to avoid a deformation of the wiring substrate.

Hogerton describes a deformable substrate assembly, which is produced by a deformation of contact pads during the bonding process. According to column 3, lines 18 to 20, of Hogerton, a circuit substrate material is provided which is locally deformable where the IC bonding element contacts the circuit structure on the substrate. According to column 3, lines 44 to 46 of Hogerton, the substrate material has a glass transition temperature below the temperature at which the adhesive used to bond the assembly is processed. This means that the substrate is deformed during the bonding process, which is performed at an elevated temperature to render the substrate material sufficiently deformable. There is no indication that the bonds are produced before the substrate material is deformed. Quite to the contrary, lines 30 to 33 in column 3 of Hogerton emphasize that the deformation in the

substrate takes place during the formation of the electric contacts. It is stated that the localized deformation in the substrate creates a kind of "wiping action" between the IC bonding element and the circuit trace, which results in the formation of an intimate and high integrity electrical contact between them. Therefore, the deformation in the substrate must take place while the bonding is in the state of being formed, the resulting form of the substrate surface in the localized areas and the contact bondings thus being created simultaneously and adapted to one another.

In contrast, the method according to the invention of the instant application aims at producing the electric contacts in the desired form without the risk of a subsequent deterioration of the electric contacts by a shift of the relative position of the substrate and the chip in the course of the substrate deformation. Therefore, the electric bonds are solidified before the deformation of the substrate. Thus the inventive method produces an arrangement of the chip and the substrate in which all electric contacts are securely connected, even if the surface of the components is not completely planar, and the IC chip is inserted in the substrate in such a manner that a tight connection is achieved and no internal stress is maintained within the substrate foil. There is no indication in the cited references that the

bonding process should be performed by solidifying the electric connection first and then completing the deformation of the substrate foil.

Clearly, none of the cited references shows the feature that the bonding agent is brought to solidification before the plastic deformation of the substrate takes place, as recited in claims 1 and 12 of the instant application.

Claims 1 and 12 are, therefore, believed to be patentable over the art and since all of the dependent claims are ultimately dependent on claim 1, they are believed to be patentable as well.

Applicant acknowledges the Examiner's statement in item 4 on page 3 of the above-mentioned Office action that claims 6-8 and 10 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Since claim 1 is believed to be patentable as discussed above and claims 6-8 and 10 are dependent on claim 1, they are believed to be patentable in dependent form. A rewrite is therefore believed to be unnecessary at this time.

Claims 13-14 have been added, support for which may be found, for example, on page 6, lines 16-17, page 7, lines 11-13, and page 8, lines 9-25 of the specification.

In view of the foregoing, reconsideration and allowance of claims 1-14 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate a telephone call so that, if possible, patentable language can be worked out.

If an extension of time for this paper is required, petition for extension is herewith made. Please charge any fees which might be due with respect to 37 CFR Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,

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